

point in a range between 50°C and 160°C and a viscosity in a range between 10 (c poise) and 10¹³ (c poise) under a temperature above said softening or melting point.

71. (Amended) An image forming apparatus as defined in Claim 61, further comprising guide roller means for supporting said endless belt means and serving as cooling means for cooling said toner image after said toner image is fixed with heat by said heating means on said recording sheet, said guide roller means being arranged at a position downstream from said heating means in said direction in which said recording sheet is transferred.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-75 are pending in the present application with Claims 1, 2, 16, 17, 26, 31, 32, 40-42, 46, 47, 61, 62 and 71 having been amended by the present amendment.

In the outstanding Office Action, the title was objected to; Claims 2, 17, 26, 32, 40, 41, 42, 47, 62 and 71 were rejected under 35 U.S.C. § 112, second paragraph; Claims 1, 3, 6-8, 10, 12, 16, 18, 21-23, 27, 31, 33, 36-38, 46, 48, 51-53, 57, 61, 63, 66-68 and 72 were rejected under 35 U.S.C. § 102(e) as anticipated by Kanari et al; Claims 2, 17, 32, 47 and 62 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kanari et al in view of Hagi et al; Claims 10, 11, 25, 26, 40, 41, 55, 56, 70 and 71 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kanari et al in view of Koh et al; Claims 14, 29, 44, 59 and 74 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kanari et al in view of Okuda; and Claims 4, 5, 9, 13, 15, 19, 20, 24, 28, 30, 34, 35, 39, 43, 45, 49, 50, 54, 58, 60, 64, 65, 69, 73 and 75 were indicated as allowable if rewritten in independent form.

Applicants thank the Examiner for the indication of allowable subject matter.

Regarding the objection to the title, a new title has been added that is clearly indicative of the invention to which the claims are directed. Accordingly, it is respectfully requested this objection be withdrawn.

Regarding the rejection of the claims under 35 U.S.C. § 112, second paragraph, the appropriate claims have been amended in light of the comments noted in the outstanding Office Action and as shown on the marked-up copies. Accordingly, it is respectfully requested this rejection be withdrawn.

Claims 1, 3, 6-8, 10, 12, 16, 18, 21-23, 27, 31, 33, 36-38, 46, 48, 51-53, 57, 61, 63, 66-68 and 72 stand rejected under 35 U.S.C. § 102(e) as anticipated by Kanari et al. This rejection is respectfully traversed.

The present invention as recited in amended Claim 1 is directed to a fixing apparatus including a heater controller configured to control an amount of heat produced by a heater in accordance with image information transferred on a recording sheet. Independent Claims 16, 31, 46 and 61 include similar features.

In a non-limited example, Figure 6 illustrates a way how an energy of electric power is saved by the fixing operation of a fixing unit 11 (see Figure 1, for example). (See also page 18, lines 16 and 17). In more detail, Figure 6 represents a relationship among positions of the heater 12, the recording sheet P, and the toner images T1-T5 and a relationship between the heater driving signal expressed as the signal A_{int} and the toner images T1-T5 at the same time (see page 18, line 24 to page 19, line 3).

Figure 6 attempts to express a way how the energy of the electric power for the fixing process is saved when the recording sheet P having toner images T1-T5, for example, is processed by the fixing unit 11. As shown in Figure 6, the toner images T1-T5 are different

in size from each other, for example. During the time the recording sheet P passes through the fixing unit 11, the signal A_{int} is raised to a high so as to drive the heater 12 each time one of the toner images T1-T5 is brought close to the heater 12. The signal A_{int} is dropped to a low so as to turn off the heater 12 when each of the toner images T1-T5 is brought away from the heater 12 as the recording sheet P is being transferred in the fixing unit 11 (see page 19, lines 8-20).

In this way, the fixing unit 11 can greatly save the energy of the electric power through its fixing operation (see page 19, line 24 to page 20, line 1).

The outstanding Office Action applies Kanari et al as disclosing the claimed fixing apparatus. However, Applicants note that Kanari et al do not disclose a heater controller that controls an amount of heat produced by the heater in accordance with image information formed on the recording sheet. Rather, the heater in Kanari et al produces heat regardless of the image information formed on the recording sheet. In more detail, Kanari et al is directed to switching between heating member 12a for a wide recording material and heating member 12b for a narrow recording material according to the width (not image information) of the recording material (see column 5, lines 45-51). Once the appropriate heating member 12a, 12b is selected, the amount of heat generated is constant. Accordingly, the advantage to the present invention cannot be achieved with the device in Kanari et al.

Therefore, it is respectfully submitted independent Claims 1, 16, 31, 46 and 61 and each of the claims depending therefrom are allowable.

Further, regarding the additional rejections noted in the outstanding Office Action for the dependent claims, Applicants note the additional publications of Hagi et al, Koh et al and Okuda also do not teach or suggest controlling an amount of heat produced by a heater as

claimed by the present invention. Accordingly, it is respectfully requested these rejections also be withdrawn.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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Amendment Filed

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IN THE TITLE

Please delete the title in its entirety and substitute therefor:

--FIXING APPARATUS AND METHOD FOR CONTROLLING AMOUNT OF HEAT
PRODUCED BY HEATER IN ACCORDANCE WITH IMAGE INFORMATION.--

IN THE CLAIMS

--1. (Amended) A fixing apparatus, comprising:

a heater having a line shape orthogonal to a direction in which a recording sheet
carrying an unfixed toner image formed with toner in accordance with image information is
transferred;

an endless belt configured to be rotated with an inner surface thereof sliding over a
surface of said heater;

a pressure roller arranged at a position opposite to said heater relative to said endless
belt, said pressure roller being held for rotation in contact with said endless belt under
pressure to form a nip therebetween; and

a heater controller configured to [energize] control an amount of heat produced by
said heater in accordance with said image information on the recording sheet,

wherein, when said recording sheet is brought to said nip with said unfixed toner
image facing said endless belt, said pressure roller applies pressure to said recording sheet

against said endless belt so that said unfixed toner image is fixed on said recording sheet with heat by said heater as said recording sheet is transferred by movement of said endless belt and said pressure roller.

2. (Amended) A fixing apparatus as defined in Claim 1, wherein said toner includes a resin as a main adhesive agent and has properties of a softening or melting point in a range between 50°C and 160°C and a viscosity in a range between 10 ~~[[c poise]]~~ (c poise) and 10¹³ ~~[[c poise]]~~ (c poise) under a temperature above said softening or melting point.

16. (Twice Amended) A fixing apparatus, comprising:

heating means for heating an unfixed toner image formed with toner on a recording sheet in accordance with image information, said heating means having a line shape orthogonal to a direction in which said recording sheet is transferred;

endless belt means for being rotated with an inner surface thereof sliding over a surface of said heating means;

pressure roller means being held for rotation in contact with said endless belt means under pressure to form a nip therebetween, said pressure roller means being arranged at a position opposite to said heating means relative to said endless belt means; and

heater controlling means for [energizing] for controlling an amount of heat produced by said heating means in accordance with said image information on the recording sheet,

wherein, when said recording sheet is brought to said nip with said unfixed toner image facing said endless belt means, said pressure roller means applies pressure to said recording sheet against said endless belt means so that said unfixed toner image is fixed on said recording sheet with heat by said heating means as said recording sheet is transferred by movement of said endless belt means and said pressure roller means.

17. (Amended) A fixing apparatus as defined in Claim 16, wherein said toner includes a resin as a main adhesive agent and has properties of a softening or melting point in a range between 50°C and 160°C and a viscosity in a range between 10 [[c poise]] (c poise) and 10¹³ [[c poise]] (c poise) under a temperature above said softening or melting point.

26. (Twice Amended) A fixing apparatus as defined in Claim 16, further comprising guide roller means for supporting said endless belt means and serving as cooling means for cooling said toner image after said toner image is fixed with heat by said heating means on said recording sheet, said guide roller means being arranged at a position downstream from said heating means in said direction in which said recording sheet is transferred.

31. (Twice Amended) A fixing method of image forming, comprising the steps of:
forming a nip between an endless belt and a pressure roller which are held for rotation in contact with each other under pressure;

providing a heater at position inside said endless belt, in contact with said endless belt, and opposite to said pressure roller relative to said endless belt, said heater having a line shape orthogonal to a direction in which a recording sheet having an unfixed toner image formed with toner in accordance with image information is transferred;

rotating said endless belt and said pressure roller, said endless belt sliding over a surface of said heater by rotation;

transferring said recording sheet to said nip, said recording sheet being in an orientation in which said toner image faces said endless belt; and

[energizing] controlling an amount of heat produced by said heater in accordance with said image information on the recording sheet when said toner image is brought to said heater.

32. (Amended) A fixing method as defined in Claim 31, wherein said toner includes a resin as a main adhesive agent and has properties of a softening or melting point in a range between 50°C and 160°C and a viscosity in a range between 10 ~~[[c poise]]~~ (c poise) and 10¹³ ~~[[c poise]]~~ (c poise) under a temperature above said softening or melting point.

40. (Twice Amended) A fixing method as defined in Claim 31, further comprising the step of cooling said toner image after said toner image is fixed with heat by said [heating step] heater on said recording sheet.

41. (Twice Amended) A fixing method as defined in Claim 31, further comprising the step of providing a guide roller for supporting said endless belt and for serving as a cooling member for cooling said toner image after said toner image is fixed with heat by said [heating step] heater on said recording sheet, said guide roller being arranged at a position downstream from said heater in said direction in which said recording sheet is transferred.

42. (Twice Amended) A fixing method as defined in Claim 31, further comprising the step of providing a member for causing said endless belt to tightly hold said toner image and said recording sheet together until said toner image is fixed on said recording sheet after said toner image is subjected to the heat of said [heating step] heater.

46. (Amended) An image forming apparatus, comprising:
an image forming mechanism configured to form a toner image with toner on a recording sheet in accordance with image information;
a heater having a line shape orthogonal to a direction in which said recording sheet carrying an unfixed toner image formed by said image forming mechanism is transferred;
an endless belt configured to be rotated with an inner surface thereof sliding over a surface of said heater;

a pressure roller arranged at a position opposite to said heater relative to said endless belt, said pressure roller being held for rotation in contact with said endless belt under pressure to form a nip therebetween; and

a heater controller configured to [energize] control an amount of heat produced by said heater in accordance with said image information on the recording sheet,

wherein, when said recording sheet is brought to said nip with said unfixed toner image facing said endless belt, said pressure roller applies pressure to said recording sheet against said endless belt so that said unfixed toner image is fixed on said recording sheet with heat by said heater as said recording sheet is transferred by movement of said endless belt and said pressure roller.

47. (Twice Amended) An image forming apparatus as defined in Claim 46, wherein said toner includes a resin as a main adhesive agent and has properties of a softening or melting point in a range between 50°C and 160°C and a viscosity in a range between 10 (c poise) and 10¹³ (c poise) under a temperature above said softening or melting point.

61. (Twice Amended) An image forming apparatus, comprising:

image forming means for forming a toner image with toner on a recording sheet in accordance with image information;

heating means for heating an unfixed toner image formed with toner on a recording sheet in accordance with image information, said heating means having a line shape orthogonal to a direction in which said recording sheet is transferred;

endless belt means for being rotated with an inner surface thereof sliding over a surface of said heating means;

pressure roller means being held for rotation in contact with said endless belt means under pressure to form a nip therebetween, said pressure roller means being arranged at a position opposite to said heating means relative to said endless belt means; and

heater controlling means for [energizing] controlling an amount of heat produced by said heating means in accordance with said image information on the recording sheet,

wherein, when said recording sheet is brought to said nip with said unfixed toner image facing said endless belt means, said pressure roller means applies pressure to said recording sheet against said endless belt means so that said unfixed toner image is fixed on said recording sheet with heat by said heating means as said recording sheet is transferred by movement of said endless belt means and said pressure roller means.

62. (Amended) An image forming apparatus as defined in Claim 61, wherein said toner includes a resin as a main adhesive agent and has properties of a softening or melting point in a range between 50°C and 160°C and a viscosity in a range between 10 [[c poise]] (c poise) and 10^{13} [[c poise]] (c poise) under a temperature above said softening or melting point.

71. (Amended) An image forming apparatus as defined in Claim 61, further comprising guide roller means for supporting said endless belt means and serving as cooling means for cooling said toner image after said toner image is fixed with heat by said heating means on said recording sheet, said guide roller means being arranged at a position downstream from said heating means in said direction in which said recording sheet is transferred.--